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09/749,191	12/26/2000	Kashmir S. Sahota	E0520CIP	6191

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 07/22/2003

18

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No. 09/749,191

Applicant(s) SAHOTA ET AL.

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-55, 61 and 63-73 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 58-61 and 63-73 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) 1-55 and 62 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____.

DETAILED ACTION***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 58 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh et al. (US 5,807,165) in view of Murphy et al. (US 5,478,435).

Uzoh teaches a method of planarizing a semiconductor wafer that has a SiO₂ insulator layer **16**, a Cu layer **SL** and a Ta metal line layer **LL** (column 1, lines 33-42; column 5, lines 33-37; and Figure 6). The method includes using a CMP apparatus **60**, which includes a rotatable polishing platen **62** attached to a rotatable shaft **68**, a polishing pad **64** mounted to the platen **62**, a means for urging carrier **66** against the pad **64**, and a polishing slurry supply system in fluid communication with the pad **64**. The supply system includes a container **70** coupled to a conduit **72** arranged and dimensioned for dispensing polishing slurry **74** onto the pad **64** (column 5, lines 41-54 and Figures 7-10). The polishing slurry containing silica abrasive, water (DI water), 7% concentration of benzotriazole (same as applicant's copper passivation agent) and a nonionic surfactant such as Alkanol (which is the trade mark for a series of fatty alcohol-ethylene oxide condensation products and is the same applicant's polyethylene oxide surfactant), (column 4, lines 56-62). The aforementioned reads on a chemical-

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mechanical polishing (cmp) method comprising incorporating into said polishing slurry, an organic additive (Alkanol).

Uzoh differs in failing to teach incorporating into said polishing slurry for a final portion of said total polishing period of time less than or equal to 10% of said total polishing period of time and said organic additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

Murphy teaches a slurry dispensing system with controls for additive infusion, independently pumping an unmixed slurry and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract). Murphy further teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Hence, the aforementioned reads on,

additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy method of dispensing a chemical additive for the purpose reducing the cost in the use of slurries (Murphy, column 6, lines 4-7 and 23-26).

The said ("Time at temperature and mixing of the liquids can be delayed . . .") aforementioned has shown that Murphy serves as evidence that the polishing period of

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time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

Uzoh differs in failing to teach said polishing slurry containing said organic additive is formed by Point-of-Use (POU) mixing of said organic additive with said polishing slurry containing said DI water, said silica abrasive, and said Cu passivation agent, **in claim 59**.

Murphy teaches a method comprises a point of use slurry dispensing system with controls for dilution, temperature, and chemical infusion (column 3, lines 4-6). In one embodiment, liquid slurry **14** is introduced into container **21** and dispensed onto a platen **12** (or pad **13**) by a pump **22** that is utilized for controlling the flow rate of the slurry (column 4, lines 10-15). Another container **26** and pump **27** function respectively and equivalently as units **21** and **22** to provide a duplicate dispensing system for dispensing another liquid onto platen **12** (column 4, lines 48-52). The dispensing system **20** of FIG. **1** is flexible in that each of the liquid dispensing line is independent of the other. Thus, liquid flow rates and temperature of the each liquid can be set at different levels and controlled separately. Additionally, if desired, other agents (such as oxidizers, etchants and/or chemical additives) can be introduced and combined with the liquids in container **21** and/or container **26** (column 5, lines 5-12). Murphy also teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid

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is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Since Murphy teaches the adding of liquids to the polishing pad can be delayed and uses the same point of use mixing as that of the claimed invention then using Murphy method of planarizing a wafer by point of use mixing would result in said polishing slurry containing said organic additive is formed by Point-of-Use (POU) mixing of said organic additive with said polishing slurry containing said DI water, said silica abrasive, and said Cu passivation agent, adding the additive at a first or a second or any stage during the polishing.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy's method of point of use mixing in combining an organic additive with the components of a polishing slurry for the purpose of providing substantial cost and time reduction in the use of slurries, as well as allowing for improved controls over the use of the slurry (Murphy, column 6, lines 21-24).

3. Claims 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view or Murphy ('435) as applied to claim 58 above, and further in view of Yu et al. (US 5,240,552)

Uzoh teaches benzotriazole having a concentration of 200 ppm to 7%, and Alkanol (same as applicant PEG 10,000) in combination with water and silica (column 4, lines 56-61), which suggests that the concentrations of the components of the slurry are variable.

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Uzoh differs in failing to teach the slurry containing 1.54 wt% 1,2,4-triazole; 0.5 wt% PEG-10,000; 93.6 wt% silica suspension containing 13.6 wt% SiO₂; and 4.33 wt% DI water, **in claim 61**.

Yu teaches process parameters of CMP process includes time, wafer backside pressure down force, and polishing slurry composition (column 4, lines 29-32) and polishing slurry flow (column 2, lines 53-56) can be adjusted to improve the uniformity of the process (column 2, lines 62-63 and Abstract).

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh in view of Murphy by employing any of a variety of operational variables such as the concentration and flow rate of the polishing slurry and the pressure and time as taught by Yu for the purpose of improving the uniformity of the CMP process (Yu, column 2, lines 62-63 and Abstract). Yu serves as evidence that concentration and flow rate of the polishing slurry and the pressure and time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

4. Claims 63, 65, 66, 67, 68 and 70, and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view of Murphy et al. ('435).

Uzoh differs in failing to teach decreasing the flow of said polishing slurry prior to the step of removing wafer from against the platen and flowing a polishing additive

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solution onto the platen for a second period of time while inducing relative motion between said wafer and said platen and maintaining a force between said platen and said wafer; and following said step of decreasing said flow of said polishing slurry and prior to said step of removing said wafer from against said platen, flowing a polishing additive solution onto said platen, **in claim 63**.

Murphy teaches a method of dispensing a liquid slurry in polishing a surface. The method comprises a point of use slurry dispensing system with controls for dilution, temperature, and chemical infusion (column 3, lines 4-6). In one embodiment, liquid slurry **14** is introduced into container **21** and dispensed onto a platen **12** (or pad **13**) by pump **22** that is utilized for controlling the flow rate of the slurry (column 4, lines 10-15). Another container **26** and pump **27** function respectively and equivalently as units **21** and **22** to provide a duplicate dispensing system for dispensing another liquid onto platen **12** (column 4, lines 48-52). The dispensing system **20** of FIG. **1** is flexible in that each of the liquid dispensing line is independent of the other. Thus, liquid flow rates and temperature of the each liquid can be set at different levels and controlled separately. Additionally, if desired, other agents (such as oxidizers, etchants and/or chemical additives) can be introduced and combined with the liquids in container **21** and/or container **26** (column 5, lines 5-12). Since Murphy uses the same method of dispensing a polishing slurry and additive in planarizing a wafer as that of the claimed invention then using Murphy's method of planarizing a wafer by point of use mixing a polishing additive with a polishing slurry reads on, decreasing the flow rate of the polishing slurry prior to removing the wafer from the platen; and following said step of

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decreasing the flow rate of the polishing slurry and the flow rate of the polishing slurry, flowing a polishing additive solution onto said platen and would inherently result in flowing a polishing additive solution onto said platen for a second period of time while inducing relative motion between said wafer and said platen and maintaining a force between said platen and said wafer.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy's point of use mixing in decreasing the flow of the polishing slurry prior to removing the wafer from against the platen; and following said step of decreasing the flow rate of the polishing slurry, flowing a polishing additive solution onto said platen for the purpose of providing substantial cost and time reduction in the use of slurries, as well as allowing for improved controls over the use of the slurry (Murphy, column 6, lines 21-24).

Uzoh also differs in failing to teach and said polishing slurry not including said organic additive prior to said step of flowing said polishing additive solution **in claim 63**. Murphy teaches a slurry dispensing system with controls for additive infusion, independently pumping a slurry in unmixed form and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract). Murphy further teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within

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centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Hence, the aforementioned reads on,

additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh by using Murphy method of dispensing a chemical additive for the purpose reducing the cost in the use of slurries (Murphy, column 6, lines 4-7 and 23-26).

5. Claims 64, 69, 71 and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uzoh ('165) in view of Murphy ('435) as applied to claim 63 above, and further in view of Yu et al. ('552).

Uzoh in view of Murphy differs in failing to teach the concentrations of the polishing additive comprises 2.0-3.0 wt% 1,2,4-triazole; 0.1 – 2.0 wt% PEG-10,000; and DI water, **in claims 69 and 73**; and 0.5 - 2.0 psi down force of 5-30 second in a post-CMP buff step, **in claim 73**, and decreasing the flow rate of polishing slurry to zero, **in claims 64 and 71**.

Yu teaches process parameters of CMP process includes time, wafer backside pressure down force, and polishing slurry composition (column 4, lines 29-32) and polishing slurry flow (column 2, lines 53-56) can be adjusted to improve the uniformity of the process (column 2, lines 62-63 and Abstract).

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Uzoh in view of Murphy by employing any of a variety of operational variables such as the concentration and flow rate of the polishing slurry, the pressure and time as taught by Yu for the purpose of improving the uniformity of the CMP process (Yu, column 2, lines 62-63 and Abstract). Yu serves as evidence that concentration and flow rate of the polishing slurry and the pressure and time is a so-called "result effective variable." It has been held that the discovery of an optimum value for result effective variables is within the purviews of routine experimentation by the person of ordinary skill in the art. In re Boesch, 617, F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

Response to Arguments

6. Applicant's arguments filed March 18, 2003 have been fully considered but they are not persuasive. Applicant traverses the 103 rejection of claims 58, 59 and 63 as being unpatentable over Uzoh in view of Murphy. Applicant argues the failure of the Examiner to properly consider the inventive steps cited in claims 58, 59, and 63, in which the claim suggests a two-step polishing process as recited in claim 58, "incorporating into said polishing slurry for a final portion of said total polishing period of time less than or equal to 10% of said total polishing period of time, an organic additive . . . said organic additive not being included in said polishing slurry prior to said final portion of said total polishing period of time."

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Applicant's argument is unpersuasive because it has been acknowledged that Uzoh fails to teach incorporating into said polishing slurry for a final portion of said total polishing period of time less than or equal to 10% of said total polishing period of time and said organic additive not being included in said polishing slurry prior to said final portion of said total polishing period of time. Uzoh's deficiency is taught by Murphy that teaches a slurry dispensing system with controls for additive infusion, independently pumping an unmixed slurry and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract).

Applicant argues the Uzoh reference fails to recognize a two-step process to minimize clogging of filters in the polisher (as stated in the Specification, page 31, line 25) and to prevent copper staining and precipitates onto the wafer with the use of an organic additive during the entire polishing process. In response to applicant's argument that the reference fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a two-step process of preventing copper staining and precipitates onto the wafer) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues the absence of teaching regarding a two-step process wherein the organic additive is included in the slurry only during a final portion of the polishing

period of the wafer by the Murphy reference. Applicant's argument is unpersuasive because Murphy teaches a slurry dispensing system with controls for additive infusion, independently pumping an unmixed slurry and a diluting agent, mixing the slurry and diluting agent at the point of use on the pad or in a dispensing line just prior to the point of use, and using a third independent distribution lines to dispense a chemical additive at or near the point of use (Abstract). Murphy further teaches, "Time at temperature and mixing of the liquids can be delayed until the liquid is within centimeters of actual dispense onto the polishing pad" (column 6, lines 12-16). Hence, the aforementioned reads on, additive not being included in said polishing slurry prior to said final portion of said total polishing period of time.

Applicant traverses the 103 rejection claims 60-61, 64, 69, 71, and 73 as being unpatentable over Uzoh in view of Murphy and further in view of Yu. Applicant argues as above and further asserts that Yu fails to teach or imply a two-step polishing process wherein an organic additive is included for a final portion only of the total wafer polishing time. Applicant's argument is unpersuasive because Yu is relied upon to teach process parameters of CMP process that includes time, wafer backside pressure down force, and polishing slurry composition (column 4, lines 29-32) and polishing slurry flow (column 2, lines 53-56), which are not taught by Uzoh and Murphy and that can be adjusted to improve the uniformity of the process (column 2, lines 62-63 and Abstract).

Conclusion

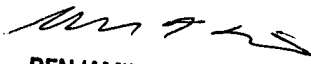
7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

ltue
July 17, 2003


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